BIOHACK NOTES

BIOTECHNOLOGY
PRINCIPLES & PROCESSES

- BASED ON ACTIVE RECALL AND SPACED REPETITION
- TARGET 360/360 IN NEET BIOLOGY & 100/100 IN BOARDS!

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• PRINCIPLES & TOOLS OF BIOTECHNOLOGY

1. EFB full form -
2. The 2 core technique that enable the birth of modern biotechnology are -
3. _____ is a specific DNA sequence which is responsible for initiating replication. (NEET)
4. Autonomously replicating circular extra-chromosomal DNA is _____ (NEET)
5. First recombinant DNA was formed by _____ and _____ (scientists) in the year _____, by working on _____ bacteria. (NEET)
6. Plasmid of _____ bacteria was taken and then it was inserted after modification in _____ bacteria.
7. _____ are known as molecular scissors. (NEET)
8. The linking of antibiotic resistance gene with the plasmid vector became possible with the enzyme _____ (NEET)
9. 3 basic steps in genetically modifying as organism is -
10. In 1963, the two enzymes responsible for restricting the growth of bacteriophage in Escherichia coli were isolated. What was the function of both of them ?
11. First restriction endonuclease was - (NEET)
12. What is the difference between endonuclease and exonuclease ?
13. How are restriction endonucleases named ?
14. Hind II palindromic sequence has ___ no. of base pairs.
15. Today we know more than ____ (no.) restriction enzymes that are isolated from ____ (no.) strains of bacteria.
16. In EcoRI, R is derived from the name of _____ (NEET)
17. EcoRI comes from bacteria - (full name) (NEET)
18. Each restriction endonuclease recognizes a specific _____ in the DNA. (NEET)
19. Palindromic nucleotide sequence of EcoRI is -
20. The DNA fragments are separated by a technique known as - (NEET)
21. In gel electrophoresis, the matrix used is of _____ (material) which is a natural polymer extracted from _____ (NEET)
22. Agarose gel provides _____ effect. (NEET)
23. DNA fragments are visualised only after staining it with _____ followed by exposure to _____
24. Red/orange coloured bands of DNA are seen.
25. The separated bands of DNA are cut out from the agarose gel and extracted from the gel piece. This step is known as _____
26. All types of plasmids are present in equal numbers in the cell. T/F

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27. _____ is responsible for controlling copying numbers of the linked DNA. (NEET)

28. The normal E coli. carry resistance to ampicillin. T/F (NEET)

29. Give examples of selectable markers for E. coli (4) -

30. Cloning sites should be preferably single/double.

31. What are transformants?

32. What are recombinants?

33. The two antibiotic resistance genes in pBR322 are -

34. pBR322 have restriction sites for (6) -

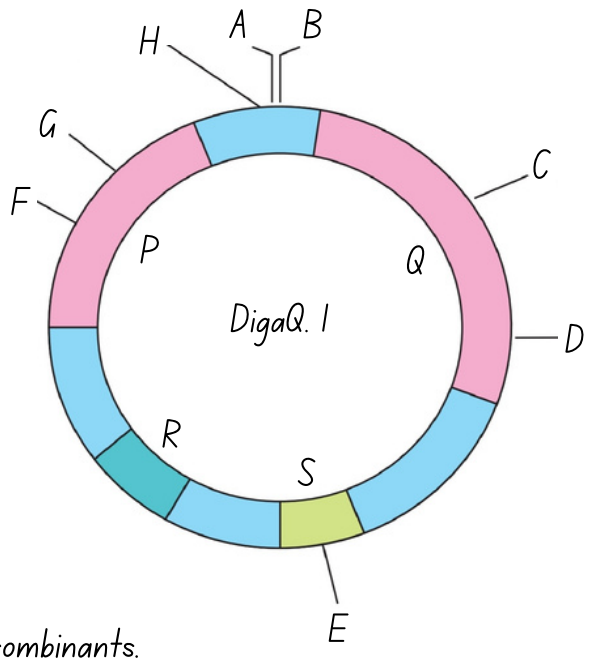
35. Rop gene codes for -

36. Restriction sites in tetR are - (2)

37. Restriction sites in ampR are - (2)

38. Restriction site in rop is -

39. "Insertional inactivation" help is selection of transformants/recombinants.



40. In chromogenic selection, DNA is inserted in the coding sequence of _____ enzyme. (NEET)

41. In absence of any insert, the colonies give _____ colour.

42. _____ is able to deliver a piece of T-DNA. (NEET)

43. Agrobacterium tumefaciens is a pathogen of monocot/dicot plants.

44. T-DNA transforms normal cells to tumor cells. T/F

45. _____ in animals have the ability to transform normal cells to cancerous cells.

46. Plasmid of Agrobacterium tumefaciens is called _____

47. Host are made competent by treating them with specific concentration of _____ion.

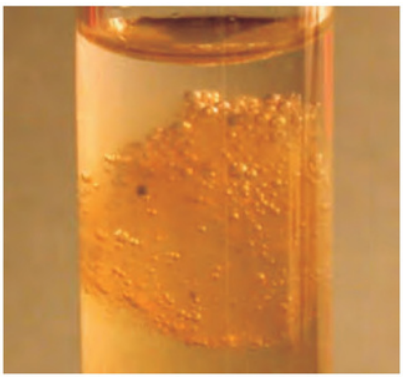
48. Heat shock is of ____ °C.

49. Recombinant DNA is forced into cells by changing temperature. Tell how ?

50. In _____ (method), recombinant DNA is directly injected into the nucleus of an animal cell.

51. In plants, cells are bombarded with high/low velocity microparticles of ____ and ____ coated with DNA in a method known as _____ or _____

DigaQ. 2. What process is going on?



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• PROCESSES OF RECOMBINANT DNA TECHNOLOGY

52. _____ is used to break bacterial membranes, _____ is used to break plant cells and _____ is used to break fungal cells. (NEET)

53. Purified DNA ultimately precipitates out after the addition of _____ (NEET)

54. Why does DNA precipitate after adding chilled ethanol ?

55. _____ is employed to check the progression of a restriction enzyme digestion. (NEET)

56. DNA moves towards the positive electrode (cathode). T/F

57. PCR full form - (NEET)

58. The 3 steps of PCR are -

59. If a PCR cycle runs 30 times, it will produce _____ times the initial amount of desired DNA sequence put into the system.

60. _____ no. of copies of desired genes will be produced after the end of first 5 cycles of PCR.

61. DNA polymerase used in PCR is isolated from bacteria - (NEET)

62. The DNA polymerase in PCR is known as _____

63. If any protein encoding gene is expressed in a heterologous host, it is called _____ protein.

64. In continuous culture systems, cells maintain themselves in log phase. T/F

65. _____ phase in the physiologically most active phase.

66. In bioreactors, ____-____ litres of culture can be processed.

67. The commonly used bioreactors are of _____ type.

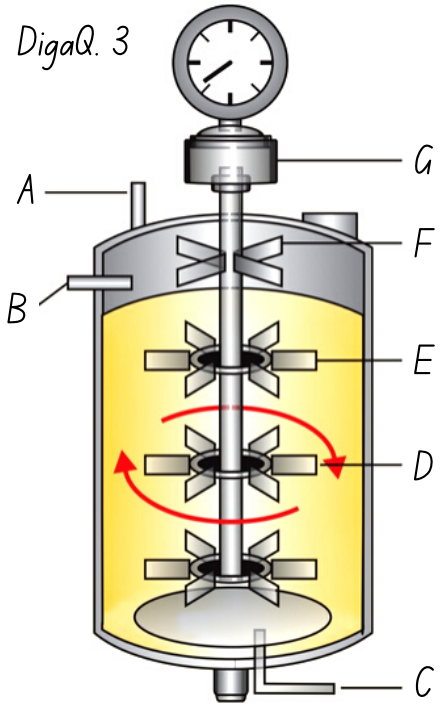
68. A stirred-tank has a curved/flat base.

69. The bioreactors have many systems attached to them. Name them all. (6)

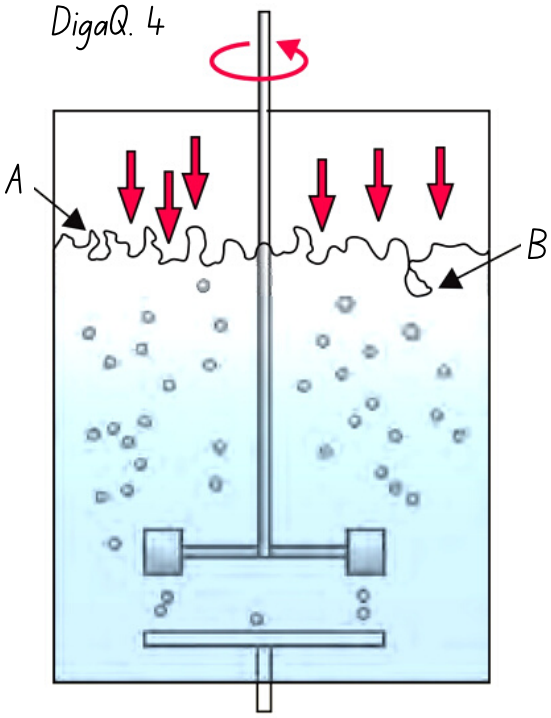
70. _____ and _____ are collectively referred to as downstream processing. (NEET)

71. The downstream processing and quality control testing vary from product to product. T/F

DigaQ. 3



DigaQ. 4



BIOTECHNOLOGY
PRINCIPLES & PROCESSES

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ANSWERS

• PRINCIPLES & TOOLS

1. European Federation of Biotechnology (EFB)
2. Genetic engineering & Bioprocess Engineering
3. Origin of replication
4. Plasmid
5. Stanley Cohen and Herbert Boyer, 1972, Salmonella typhimurium
6. Salmonella typhimurium, E coli.
7. Restriction endonuclease
8. DNA ligase
9. Identification of DNA, introduction of DNA, maintenance of introduced DNA
10. One added methyl groups to DNA, while the other cut DNA
11. Hind II
12. Exonucleases remove nucleotides from the ends of the DNA whereas, endonucleases make cuts at specific positions within the DNA
13. First letter comes from genus and second two letters come from species, then one letter from the strain and the Roman numbers following the names indicate the order in which the enzymes were isolated from that strain of bacteria.
14. 6
15. 900, 230
16. Strain
17. Escherichia coli RY 13
18. Palindromic nucleotide sequence
19. GAATTC
20. Gel electrophoresis
21. Agarose, sea weeds
22. Sieving
23. Ethidium bromide, UV radiation
24. Orange
25. Elution
26. F
27. Ori
28. F
29. Ampicillin, chloramphenicol, tetracycline or kanamycin resistant genes
30. Single
31. Transformants are the cell that has taken the additional genetic material (it may be natural or genetically engineered)
32. Recombinants are the cells who have taken up the genetically engineered genetic material.
33. Ampicillin and tetracycline
34. Hind III, EcoR I, BamH I, Sal I, Pvu II, Pst I, Cla I
35. Proteins involved in replication of plasmid
36. BamH I, Sal I
37. Pvu I, Pst I
38. Pvu II
39. Recombinants
40. β-galactosidase
41. Blue
42. Agrobacterium tumefaciens
43. Dicot
44. T
45. Retrovirus
46. Ti Plasmid
47. Calcium
48. 42°C
49. First cells are incubated on ice, then heat shock is given, and then again incubated on ice
50. Micro-injection
51. High, gold and tungsten, biolistics or gene gun

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• PROCESSES OF RECOMBINANT DNA TECHNOLOGY

52. Lysozyme, cellulase and chitinase
53. Ethanol
54. Ethanol has a low dielectric constant. As DNA is a polar molecule, it would be more soluble in polar solvents like water. As ethanol is less polar, it precipitates out in it.
55. Agarose gel electrophoresis
56. F, anode
57. Polymerase chain reaction
58. Denaturation, annealing and extension
59. 2^{30}
60. 6 (you may think that ans should be $2^5 = 32$, but on close observation you will notice that desired DNA sequence do not start to form till the 3rd step)
61. Thermus aquaticus
62. Taq polymerase
63. Recombinant
64. T
65. log/exponential
66. 100-1000
67. Stirring type
68. Curved
69. Systems in bioreactors
    I. Agitator system
    II. Oxygen delivery system
    III. Foam control system
    IV. Temperature control system
    V. pH control system
    VI. Sampling ports
70. Separation and purification
71. T

• DigaQs

DigaQ. 1 – pBR322

A – Cla I
B – Hind III
C – BamH I
D – Sal I
E – Pvu II
F – Pst I
G – Pvu I
H – EcoR I

P – amp^r
Q – tet^r
R – ori
S – rop

DigaQ. 2 - Spooling

DigaQ. 3 - Simple stirred-tank bioreactor

A – Acid/base for pH control
B – Steam for sterilization
C – Sterile air
D – Culture broth
E – Flat bladed impeller
F – Foam breaker
G – Motor

DigaQ. 4 - Sparged stirred-tank bioreactor through which sterile air bubbles are sparged

A – Increased surface area for oxygen transfer
B – Gas entrainment

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SCAN AND DONATE US SO THAT WE CAN CREATE MORE SUCH QUALITY CONTENT FOR YOU!

JUST ₹10-20 WILL BE APPRECIABLE! :)

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